

IN THE CLAIM

1-8. (canceled)

9. (withdrawn) A thin film forming apparatus comprising:

a substrate holder which is disposed in a vacuum tank and which holds a substrate;

a film formation process zone which is disposed in the vacuum tank and in which sputtering is performed with respect to a target comprising at least one type of metal to form an intermediate thin film on the substrate;

a reaction process zone comprising an active seed generator for generating an active seed of a reactive gas, and disposed in the vacuum tank, in which the intermediate thin film is reacted with the active seed of the reactive gas to form a thin film;

a partitioning mechanism for spatially separating the film formation process zone and the reaction process zone from each other;

a substrate holder driver for driving the substrate holder in order to convey the substrate between a position facing the film formation process zone and a position facing the reaction process zone; and

substrate holder conveying speed controller for controlling the substrate holder driver in a range configured to form the thin film having an optical characteristic value in a region where a hysteresis phenomenon occurs in which a change route of the optical characteristic value differs with respect to a reactive gas flow rate in a case where the flow rate of the reactive gas is increased and in a case where the rate is decreased.

10. (currently amended and withdrawn) The thin film forming apparatus according to claim 9 4, wherein the region where the hysteresis phenomenon occurs is a region of the optical characteristic value of the thin film formed when the reactive gas introduced in performing the sputtering has a flow rate of 15 sccm or less, which does not include 0 sccm.

11-14. (canceled)

15. (new) A method of forming a thin film comprising:

sputtering a target in a sputtering zone, wherein the target comprises at least one type of metal, wherein the sputtering forms an intermediate thin film on a substrate,

and wherein the intermediate thin film comprises the metal or an incomplete reactant of the metal;

reacting the intermediate thin film with a reactive gas in a reactive zone so as to convert the intermediate thin film into a compound of the metal;

repeatedly conveying the substrate between the sputtering zone and the reactive zone; and,

adjusting the speed of the conveying so as control an optical characteristic of the thin film in a hysteresis region which would have otherwise occurred if the optical characteristic had been controlled by controlling a rate of flow of the reactive gas, wherein the hysteresis region is a region where the optical characteristic is different depending upon whether the flow rate of the reactive gas is increased or is decreased.

16. (new) The method of claim 15, wherein the reacting of the intermediate thin film with a reactive gas in a reactive zone comprises reacting the intermediate thin film with the reactive gas and an inactive gas in the reactive zone, and wherein the inactive gas has a chemically inactive property.

17. (new) The method of claim 15, wherein the hysteresis region comprises a region where the reactive gas has a flow rate of 15 sccm or less and does not include 0 sccm.

18. (new) The method of claim 15, wherein the adjusting of the speed of the conveying comprises:

rotating a substrate holder holding the substrate on an outer peripheral face, where the substrate holder has a cylindrical or hollow polygonal columnar shape; and,

adjusting a rotation speed of the substrate holder so as control the optical characteristic of the thin film in the hysteresis region.

19. (new) The method of claim 15, wherein the repeated conveying of the substrate comprises conveying the substrate along a periphery having at least one of a cylindrical and a hollow polygonal columnar shape.

20. (new) The method of claim 15, wherein the sputtering of a target in a sputtering zone comprises reversing polarity between first and second sputtering electrodes so that the first electrode oscillates between cathode and anode states, so that the second electrode has an

anode state while the first electrode has a cathode state, and so that the second electrode has a cathode state while the first electrode has an anode state.

21. (new) The method of claim 15, further comprising supplying the reactive gas to the reactive zone at a constant flow rate in the hysteresis region of the optical characteristic.

22. (new) An apparatus for forming a thin film, the apparatus comprising:

a sputtering zone holding a target, wherein the target comprises at least one type of metal, wherein the target is sputtered to form an intermediate thin film on a substrate, and wherein the intermediate thin film comprises the metal or an incomplete reactant of the metal;

a reactive zone having a reactive gas that reacts with the intermediate thin film so as to convert the intermediate thin film into a compound of the metal; and,

a conveyor that repeatedly conveys the substrate between the sputtering zone and the reactive zone, wherein the speed of the conveyor is adjusted so as control an optical characteristic of the thin film in a hysteresis region which would have otherwise occurred if the optical

characteristic had been controlled by controlling a rate of flow of the reactive gas, and wherein the hysteresis region is a region where the optical characteristic is different depending upon whether the flow rate of the reactive gas is increased or is decreased.

23. (new) The apparatus of claim 22, wherein the reactive zone also includes an inactive gas, and wherein the inactive gas has a chemically inactive property.

24. (new) The apparatus of claim 22, wherein the hysteresis region comprises a region where the reactive gas has a flow rate of 15 sccm or less and does not include 0 sccm.

25. (new) The apparatus of claim 22, wherein the conveyor comprises a rotating conveyor and a substrate holder, wherein the substrate holder holds the substrate, wherein the rotating conveyor rotates the substrate holder holding the substrate on an outer peripheral face, and wherein the substrate holder has a cylindrical or hollow polygonal columnar shape.

26. (new) The apparatus of claim 22, wherein the conveyor is arranged to convey the substrate along a periphery having at least one of a cylindrical and a hollow polygonal columnar shape.

27. (new) The apparatus of claim 22, wherein the sputtering zone includes first and second electrodes, wherein during sputtering a polarity of the first electrode oscillates between cathode and anode states so that the second electrode has an anode state while the first electrode has a cathode state, and so that the second electrode has a cathode state while the first electrode has an anode state.

28. (new) The apparatus of claim 22, wherein the reactive gas is supplied to the reactive zone at a constant flow rate in the hysteresis region of the optical characteristic.